SPECIES LIFE HISTORY AND HABITAT REQUIREMENTS

SAGE GROUSE

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Technical Supplement 6601-3, Sage Grouse

1. Explanation of Material Transmitted: This release replaces Appendix 2, Release 6-10, and is reissued as Technical Supplement, 6601-3, which covers the Sage Grouse life history and habitat requirements.

2. Reports Required: None

3. Material Superseded: Manual pages superseded by this release are listed under "Remove" below.

4. Filing Instructions: After the attached Technical Supplement, 6601-3 has been filed, as indicated below, this transmittal sheet may be discarded.

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SAGE GROUSE

Table of Contents

	Page
A. Importance	1
B. Distribution	1
1. Past	
2. Present	
C. Habitat	1
D. Life History	2
1. Courtship and Breeding	
2. Nesting	
3. Rearing of Young	
4. Productivity	
5. Populations	
E. Movements	4
F. Cover Requirements	4
1. Strutting Grounds	
2. Nesting Cover	
3. Loafing Cover	
4. Roosting Cover	
5. Winter Cover	
G. Food Habits	5
1. Feeding Behavior	
2. Food Requirements	
3. Water Requirements	
H. Limiting Factors	6
1. Habitat	
2. Food and Cover	
3. Water	
4. Weather and Production	
5. Disease and Parasites	
6. Predators	
7. Hunting	
I. Management	8

SAGE GROUSE

Illustrations:

1. Sage Grouse Distribution 9

2. Sage Grouse Behavioral Annual Cycle (General) . . . 10

Selected References 11

SAGE GROUSE

A. Importance. Sage grouse, the largest native American grouse, constitute a major game bird resource in the western states. While the annual harvest is not as high as several other species of grouse, the sage grouse is a unique bird providing a distinctive type of hunting. The intimate association with sagebrush and spectacular breeding displays make this bird especially important to naturalists and photographers. In recent years ten states have had hunting seasons for sage grouse providing an estimated annual harvest in excess of 205,000 birds by at least 90,000 hunters.

B. Distribution. (See Illustration 1)

1. Past. In pristine times sage grouse were found throughout the sagebrush range.

2. Present. Sage grouse presently occupy most of their historic range in reduced numbers and have disappeared mainly from areas on the periphery of the former range or where extensive areas of sagebrush have been removed.

C. Habitat. The preferred habitat is the sagebrush-grass type and associated irrigated lands, river bottoms and dry farm lands surrounded by or adjacent to sagebrush. Sage grouse also occur in the salt desert shrub type; however, Artemisia sp. is the most important plant species of the habitat. Good sage grouse range apparently consists of the various subtypes of sagebrush such as short, medium and tall stands of various densities. All subtypes are used by sage grouse for various requirements and at different seasons.

Gill (Reference #6), working in north central Colorado, classified sagebrush types according to height, site and use by sage grouse.

Type	Height range	Use
A-1 sagebrush	Average less than 5 inches	Strutting grounds
	Typical of upper slopes on ridges and benches, generally on well drained and shallow soils. Sagebrush has mat-like growth form and plants have almost no persistent seed heads.	

SAGE GROUSE

Type	Height range	Use
A-2 sagebrush	5 to 10 inches	Feeding sites, particularly during breeding season
	Primarily on lower slopes of ridges and benches on well drained slopes. Plants characterized by open canopies with few persistent seed heads.	
A-3 sagebrush	10 inches and taller	Used mainly as loafing and shading sites
	Primarily in swale bottoms between ridges on deeper and more fertile soils. Plants have closed crown canopies, grow in dense stands and have numerous persistent seedheads which give the subtype an orange hue.	

D. Life History. The generalized annual cycle of a sage grouse population is shown on Illustration 2. The time of the various activities would vary slightly, depending on weather and geographic area; however, the sequence of events would apply to all sage grouse populations.

1. Courtship and Breeding. Sage grouse have an elaborate and spectacular courtship display. As soon as the snow recedes in late February the males congregate on strutting grounds. Courtship and breeding activities center on these strutting grounds, which range in size from a few hundred square feet to up to forty acres. Strutting grounds are typically open and flat where adjacent sagebrush is low growing and sparse. The males arrive on the strutting grounds before the females, but no social structure is developed until the hens arrive. After the hens arrive, a definite social structure develops, and males compete for strutting territories. These males at the top of the "peck order" are called master cocks and are surrounded by sub cocks which occupy adjacent territories. Scott (Reference #16) observed that master cocks accomplished about 75 percent of the matings. Crawford (Reference #2) recorded the total area defended by master cocks rarely exceeded 20 feet in radius. Sage grouse are polygamous, and mating takes place a day or two after the hen arrives on the strutting ground. After mating, the hens leave the strutting areas to begin nesting activities.

SAGE GROUSE

2. Nesting. The female constructs the nest close to the strutting grounds, usually within two miles. The nests are elliptical depressions in the ground about eight inches long, seven inches wide, and two inches deep. The nests are not elaborate structures but usually have a lining of grass, sage twigs and feathers. Nests are practically always located at the base of or near a sagebrush plant. Other shrub cover is sometimes used, but sagebrush is the preferred species. Clutch size runs from five to twelve but averages between six and eight eggs. The eggs are laid at a rate of about one egg per 1.3 days. Incubation usually begins the day after the deposition of the last egg in the clutch. Studies have shown the incubation periods vary from 20 to 27 days with 24 to 25 days about average. Periods of unfavorable weather can extend the incubation period. Hatching success has been reported as low as 23 percent in Oregon to a high of 60 percent in Utah. Success will vary from season to season with weather and vegetative conditions.

3. Rearing of Young. The hen and chicks usually remain in the vicinity of the nests for the first two or three weeks after hatching. Hens rear the young and males have no association with the young until the flocking period in late summer. Females with broods often move to meadow areas in the summer. Three components seem to provide ideal brood habitat: sagebrush, water and hayland, either irrigated or native. The family association between chick and hen is not as strong as with other grouse, and it is common for a chick to stray and become associated with a different brood.

4. Productivity. Sage grouse populations exhibit normal population fluctuations from year to year, and there is some evidence to suggest that the species may be cyclic, that is, regular highs and lows over periods of several years. The relatively low reproductive rate plus the limiting factors discussed under Section H and the fact that sage grouse produce the smallest clutches of any American grouse put sage grouse in the position of having the lowest productivity of American grouse.

5. Populations. Sage grouse are very difficult to sample quantitatively because of their movements and gregarious habits which tend to vary by day and by season. Rogers (Reference #15) developed a useful classification system which helps classify populations in relation to habitat. Using data from roadside counts in Colorado's best sage grouse range he classified populations as follows:

SAGE GROUSE

Sage grouse/sq. mile (Fall population)	Classification
30 to 50	Good
10 to 30	Fair
1 to 10	Light

Patterson (Reference #13), working in Wyoming, found on good range spring populations of 30 to 50 birds per square mile, or 13 to 21 acres per grouse.

E. Movements. Sage grouse do not migrate in the sense of waterfowl and dove migrations which are in response to photoperiodism; however, they do undergo rather long seasonal movements in some areas. Dalke et. al. (Reference #3) found round trip movements in Idaho of 50 to 100 miles. Sage grouse movements can best be described by season.

In the early spring the adult males move from the wintering areas to the strutting grounds. The females move to the breeding areas one or two weeks later. In late spring and early summer the birds move to summering areas where water and suitable vegetation are available. Often this spring-summer movement is a movement to higher altitudes. In some areas post-breeding movements are to irrigated meadows and alfalfa fields. In the fall the birds form flocks and move toward wintering grounds when mean temperatures approximate 20 to 50 degrees Fahrenheit.

As snow depths increase in winter, birds tend to move to lower elevations. Movement starts when snow depths reach or exceed 8 to 10 inches. Large flocks, up to a thousand birds, may form in winter; and often flocking takes place in movements to and from the wintering areas.

In Colorado, Rogers (Reference #15) found a reversal of the usual winter movement to lower elevations. He found sage grouse utilizing windswept sagebrush ridges in winter and moving to lower irrigated hay meadows in the summer. In general the winter snow accumulation determined the wintering areas and resulting movements to these areas.

F. Cover Requirements. Sage grouse are intimately, probably inseparably, associated with sagebrush and almost all the cover types used are composed of various combinations of growth forms and densities of sagebrush.

1. Strutting Grounds. Strutting grounds are usually flat, open areas, and the sagebrush adjacent to the grounds is usually sparse and low in height. The grounds vary from a fraction of an acre to many

acres. Gill (Reference #6), working in northcentral Colorado, found strutting grounds on tops of low ridges vegetated by sagebrush with a low growth form and vigor. In most cases the sagebrush on the grounds was less than four inches tall. All strutting grounds were situated so that visibility was unobstructed for at least 100 yards. Patterson (Reference #13), in Wyoming, found, of 45 grounds examined, 11 were on windswept ridges or knolls; 10 on flat sagebrush areas without openings; 7 on bare openings on relatively level lands; 5 on alkaline flats; 4 on small water collecting basins; and the other 8 grounds on various other sites.

2. Nesting Cover. Most nests are located close to or under sagebrush plants 7 to 20 inches in height where vegetation covers about half the ground surface. High nesting success has been noted in small draws where bottoms were covered with low growing vegetation. Areas close to water courses are preferred for nesting sites. June (Reference #8) found in Wyoming studies, nesting areas were normally at the lowest elevation available and had a sagebrush composition of 22 percent averaging 13 inches in height. Grasses constituted 24 percent and forbs 8 percent of the stand.

3. Loafing Cover. Loafing and roosting areas, according to Patterson (Reference #13), were almost always the heavier and denser sagebrush stands. June (Reference #8), described Wyoming loafing and shading areas as limited areas of dense, heavy sagebrush which provide protection from the elements.

4. Roosting Cover. According to June (Reference #8), Wyoming roosting areas are sagebrush stands usually on ridges, flats or slopes of ridges where the sagebrush is sparse, low growing, averaging 4 to 8 inches in height. Grasses contribute about 13 percent and forbs 12 percent to the total composition.

5. Winter Cover. Wintering areas are usually flat to gentle slopes where sagebrush is about 25 percent of the cover and 12 inches or more in height. The sagebrush must be above the accumulated snow. Snow depth determines to a large extent the wintering areas. In some areas of Colorado, sage grouse occupy windswept sagebrush ridges in winter. Patterson (Reference #13) attributes the reduction in sage grouse numbers in intensively farmed areas along lower river drainages to the elimination of sagebrush which served as winter range.

G. Food Habits. No other upland game bird is so highly specialized in its food and cover requirements and so dependent on one plant taxon (Artemisia) as the sage grouse.

SAGE GROUSE

1. Feeding Behavior. The sage grouse, unlike most granivorous upland game birds, subsists largely on the leafage of sagebrush. Sage grouse lack the hard muscular gizzard which is typical of other gallinaceous birds. Sage grouse are capable of digesting some soft shelled seeds; however, they are physiologically adapted to feeding on leafage and soft plant material. Gill (Reference #6) found in his Colorado study sage grouse were selectively feeding on less vigorous sagebrush plants, types A-1 and A-2, as described in Section C, Habitat. Gill suggested this selection might be attributed to the difference between the essential volatile oil content of the leaves of sagebrush plants of various degrees of vigor. The more vigorous plants have a higher essential oil content than less vigorous plants.

2. Food Requirements. Food habit studies from various parts of the sage grouse range show that 50 or more plant species are used for food; but, of the vegetable food, 75 percent or more is composed of various species of sagebrush, and 10 percent or more is composed of Leguminosae and other forbs. Two to ten percent of the food consists of animal matter, mostly ants, grasshoppers, and beetles. Approximately 50 percent of the diet of juvenile birds in June is animal matter, but by August the juveniles consume mostly plant materials. Adult and juveniles have similar diets by the time the young are three months old. The principal sagebrush species used by sage grouse for food are Artemisia tridentata, A. nova, A. cana, and A. gnaphalodes.

3. Water Requirements. Sage grouse are capable of living for many days without water; however, water is a necessary component of good habitat. Snow provides winter water requirements. Good populations of birds are generally associated with water, particularly during the summer when the hens have broods.

H. Limiting Factors.

1. Habitat. All aspects of the sage grouse's life history, nesting, feeding, etc. are in association with various types of sagebrush. Since each aspect of the life history and required cover type is essential to the grouse, removal or substantial change in any one of these types or subtypes could be a limiting factor. An area, for example, with all habitat requirements except suitable wintering areas could not be expected to support a thriving population. Some habitat changes, namely interspersion of small openings, meadows, and patches of large or critical tracts of sagebrush is a primary limiting factor.

SAGE GROUSE

Patterson (Reference #13) attributed the great sage grouse decline of the 1930's to destruction of habitat and inadequate protection. "These decimating factors usually have operated through the media of early and extended shooting seasons, high bag limits, and overgrazing of public and private ranges, as well as elimination of sagebrush areas through agricultural practices and urban development."

2. Food and Cover. These two requirements are likewise associated with sagebrush and would be limiting under similar circumstances to those described under 1., Habitat.

3. Water is a necessary component of good summer range, but is not, under most circumstances, a limiting factor.

4. Weather and Production. Long-term weather or climate determines what species of plants will grow and, in effect, makes sage grouse habitat what it is. The birds have evolved in this habitat, and successful reaction to weather is a normal part of survival. Short-term weather conditions, however, do affect grouse populations for a limited period of time. Periods of cold rain, sleet, or snow during or shortly after hatching causes a mortality among chicks. Pyrah (Reference #14), working in Wyoming, concluded that, although above average rainfall depressed production in the year it occured, it increased production the following year.

5. Disease and Parasites. Sage grouse have the expected fauna of external and internal parasites and, undoubtedly mortalities occur due to diseases and parasites. The effects of these mortalities on grouse populations are not well known but are not generally considered an important limiting factor. Coccidiosis may have caused heavy mortality in parts of Colorado in the 40's, but no long-term or lasting declines have been tied to disease or parasites.

6. Predators. Apparently predation is a more significant population depressant for sage grouse than other grouse species. Predators take eggs, young, and adults. The destruction of nests and eggs is probably the most important form of predation. Studies on nest predation in Utah, Colorado, and Wyoming have shown from 26 to 76.2 percent of the nests under study were destroyed by various predator species. All but one Utah study of six studies in Utah, Colorado, and Wyoming showed that predator destruction of nests exceeded 50 percent. The major nest predators were badgers, coyotes, ravens, magpies, and ground squirrels (Citellus richardsoni).

SAGE GROUSE

The major avian predators of juvenile grouse are Swainson's hawk (Buteo swainsoni), red-tailed hawk (B. jamaicensis) and ferruginous hawk (B. regalis). The most important avian predator of adult sage grouse was the golden eagle (Aquila chrysaetos).

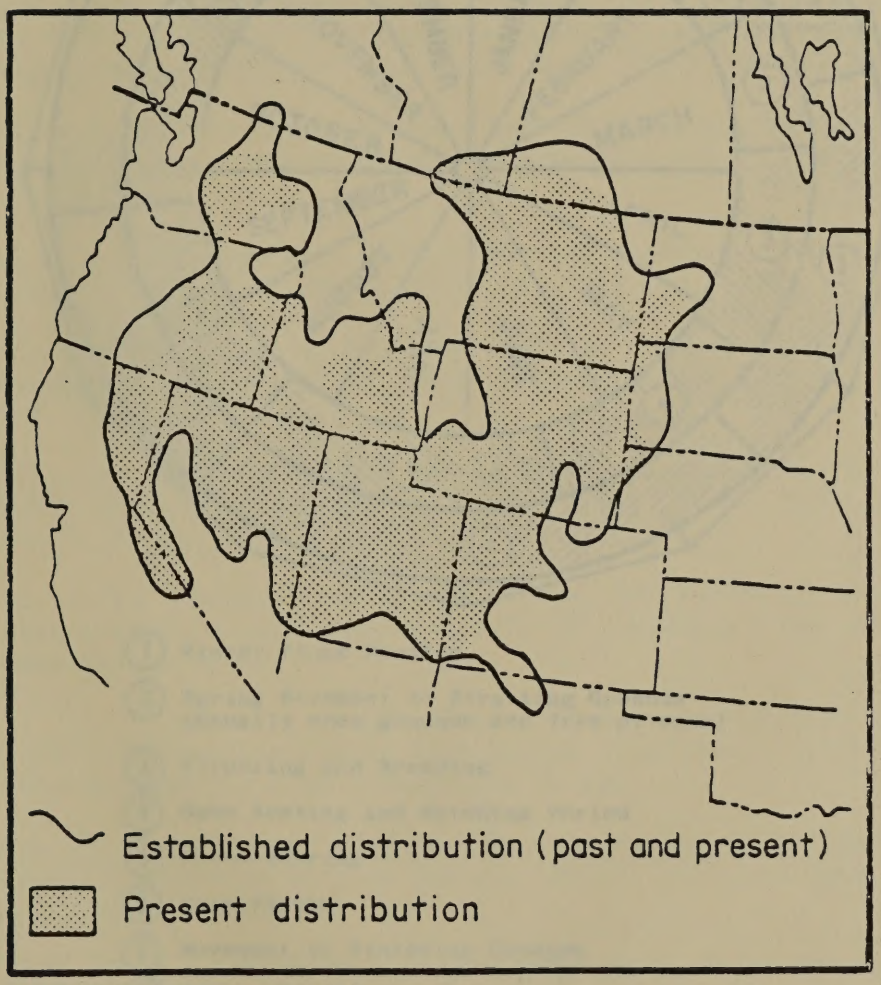
Predation, particularly on nests is a factor in reducing production below potential, but is not likely to be a major limiting factor where good habitat exists.

7. Hunting. Uncontrolled year-long hunting was probably a contributing factor to the great decline of sage grouse in the 1930's. Controlled hunting as permitted by the various states is not a significant limiting factor. Although not as productive as some other upland game birds, sage grouse are capable of sustaining fairly high hunting pressure so long as ample high quality habitat is available.

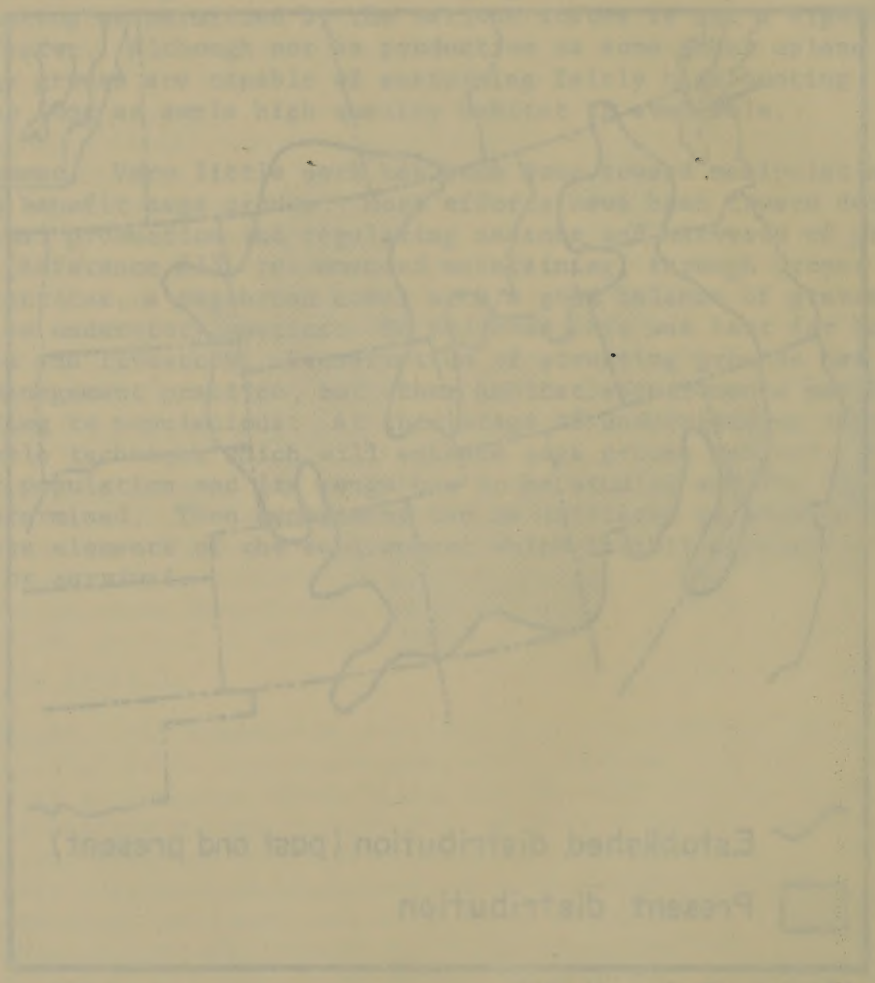
I. Management. Very little work has been done toward manipulating habitat to benefit sage grouse. Most efforts have been toward determining annual production and regulating seasons and harvests of grouse. Patterson (Reference #13) recommended maintaining, through proper grazing practices, a sagebrush cover with a good balance of grasses and forbs as understory species. He believed this was best for both sage grouse and livestock. Preservation of strutting grounds has been a common management practice, but other habitat requirements may be more limiting to populations. At this stage of understanding there is no one simple technique which will enhance sage grouse habitat. Each particular population and its range has to be studied and the limiting factors determined. Then management can be initiated to eliminate or modify those elements of the environment which inhibit population increases or survival.

SAGE GROUSE

Illus. 1 - Sage Grouse Distribution

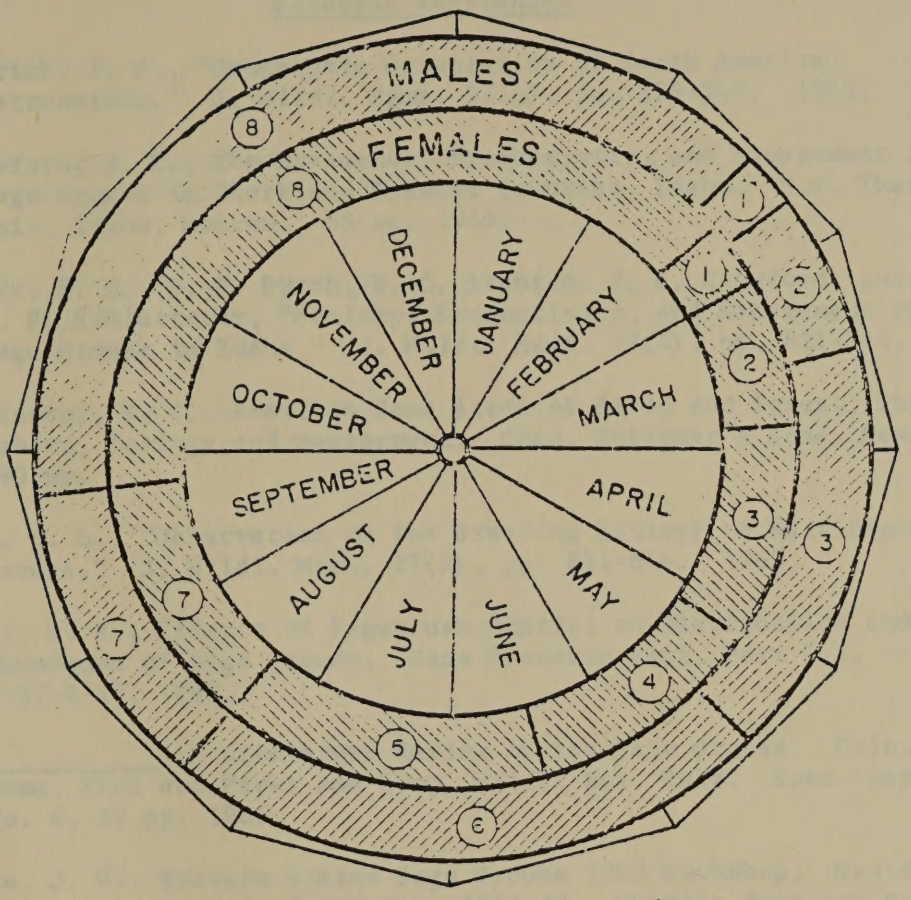


Aldrich (Reference #1)



SAGE GROUSE

Illus. 2 - Sage Grouse Annual Behavioral Cycle



1. Winter Flock Breakup
2. Spring Movement to Strutting Grounds (Usually when grounds are free of snow)
3. Strutting and Breeding
4. Hens Nesting and Hatching Period
5. Brood Rearing
6. Male Flocks
7. Movement to Wintering Grounds
8. Winter Flocks

SAGE GROUSE

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